PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IB2005/050263	24.01.2005	26.01.2004

International Patent Classification (IPC) or both national classification and IPC
G11B20/10, G11B20/18

Applicant
KONINKLIJKE PHILIPS ELECTRONICS N.V.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/IB2005/050263

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ in written format

   ☐ in computer readable form

   c. time of filing/furnishing:

   ☐ contained in the international application as filed.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-26
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-26
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations

see **separate sheet**

1. Reference is made to the following documents:

D1 : IMMINK A H J ET AL: "Signal processing and coding for two-dimensional optical storage" GLOBECOM'03. 2003 - IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE. CONFERENCE PROCEEDINGS. SAN FRANCISCO, DEC. 1 - 5, 2003, IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE, NEW YORK, NY : IEEE, US, vol. VOL. 7 OF 7, 1 December 2003 (2003-12-01), pages 3904-3908, XP010677345 ISBN: 0-7803-7974-8

D2 : WEEKS W: "Full-Surface Data Storage" THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ELECTRICAL ENGINEERING IN THE GRADUATE COLLEGE OF THE UNIVERSITY OF ILLINOIS AT URBANA- CHAMPAIGN, XX, XX, 2000, page complete, XP002227664

2. INDEPENDENT CLAIM 1

2.1. The present application does not meet the criteria of Article 33(1) PCT, because the subject matter of claim 1 does not involve an inventive step in the sense of Article 33(3)PCT.

2.1.1. Document **D1**, which is considered to represent the most relevant state of the art to the subject matter of claim 1, discloses (the references in parentheses applying to this document):

A feedback control loop (fig. 6: feedback control loop from the "2D Bit Detection (BD)" to the "2D Equalizer") for controlling parameters of a signal comprised in a block of data stored in a N-dimensional data block on a record carrier (fig. 6: ch1..ch11) where the feedback loop comprises an input for receiving an information from the record carrier ("HF_i": see equation 15 on page 3906, and page 3907, LH column, first paragraph) and error signal derivation means for deriving an error signal from the information ("HF_i-$REF_{i,cl}$": see equation 15 on page 3906).
First of all, in **D1**, the branch metric is calculated by equation (15) wherein the index "cl" as subscript denotes a "cluster-dependent reference signal (so it is based on the bits of the **first shell only**)" (see **D1** on page 3907, LH column, first paragraph). So in **D1**, the

branch metric or "error signal" for a stripe of h rows is calculated based on "a first area of the N-dimensional data block", wherein the first area is the first shell constituted by nearest neighbours 5A, 5B, 5C, 5E, 5F (see definition of a shell in the application on page 7, line 32, to page 8, line 5).

2.1.2. The subject-matter of independent claim 1 differs from the disclosure of **D1** in that: the first area is that area where the error signal can be determined within the shortest period of time.

2.1.3. The problem to be solved by the present invention may therefore be regarded as minimizing the delay and therewith increasing the stability of the feedback control loop. (see Application: page 1, line 25, to page 2, line 2).

2.1.4. The solution proposed in claim 1 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

D2 describes a MVA (Multitrack Viterbi Algorithm) for a full surface data storage in its chapter 3, from pages 25 to 56, and also equalization techniques in its chapter 4, from pages 57 to 71. This MVA processes overlapping sets of t rows (see **D2**, on section 3.3.7 on page 42). In its section 3.3.7 on page 42, an "alternative multitrack approach" is considered which processes t rows off received data in disjoint blocks, where it is explained that in cases of MVA or its alternative multitrack approach, bits on the top row of a so-called "t-block" or multidimensional block are subjects to the same error events in both cases, whereas bits on the bottom row of a "t-block" have a larger BER in the case of the alternative multitrack approach than in the case of the MVA. In **D2**, it is extensively disclosed how this MVA calculates errors.

The first area in **D1** is the first shell constituted by nearest neighbours 5A, 5B, 5C, 5E, 5F, and is enclosed in an larger sub-area of the t-block constituted by the first 2 rows and an outside bit row (see application on figure 1 for a definition of a shell). It contains so the outside bit row which is not part of the stripe to be processed (see application on page 8, lines 4, 5). The sliding direction is downwards on figure 1 as in figure 7 of **D1** and thus the reference levels of the previous Viterbi-block (or of the guard band for the top and bottom bit-rows) are used for the actual Viterbi-block. By doing this, the $REF_{i,cl}$ and thus the branch

metrics yielding the error signal can be determined within a shortest period of time as when using no outside bit row as a member of the cluster.

2.1.5. Therefore the features disclosed in **D1** and **D2** would be combined by the skilled person, without exercise of any inventive skills in order to solve the problem posed. The proposed solution in independent claim 1 thus cannot be considered inventive (Article 33(3) PCT).

3. Other claims

3.1. The additional feature of claim 2 with respect to claim 1 to which it refers is that the control loop is a high bandwidth control loop. This is not inventive either.

3.2. The additional feature of claim 3 with respect to claims 1 or 2 to which it refers is that the first area is a guard band area corresponding to the N-dimensional data block. This is obvious from **D1**, on figure 7 (see fig. 7: "g") following from the discussion on point 2.1.

3.3. The additional feature of claim 4 with respect to claims 1 or 2 or 3 to which it refers is that the feedback control loop is arranged for controlling parameters of a signal from a second area based on the error signal derived from the first area. This is obvious from the discussion on point 2.1, where the second area is the third, fourth, t-th rows inside a Viterbi window.

3.4. The additional feature of claim 5 with respect to claim 4 to which it refers is characterized in that a feedback control loop is additionally arranged for controlling parameters of a signal from the second area based on an error signal derived from the second area, whereas the additional feature of claim 6 with respect to claims 4 or 5 to which it refers is that the second area is the N-dimensional data block. This is obvious from **D2** in the alternative approach of disjoints blocks.

3.5. The additional feature of claim 7 with respect to claim 6 to which it refers is that the parameters of the signal from the second area are uniformly controlled using the error signal. Following from equation (15), this is obvious.

3.6. The additional feature of claim 8 with respect to claims 4 or 5 to which it refers is that feedback control loop is arranged for controlling parameters of a signal from a second area based on the error signal derived from the first area and a further error signal derived from a third area, whereas the additional feature of claim 9 with respect to claim 8 to which it refers is that the second area is the N-dimensional data block. This is the case in V_6 of figure 7 of **D1** where V_6 has as inputs the output of V_5 and the guard band.

3.7. The additional feature of claim 12 with respect to the previous claims is that the feedback control loop comprises a detector with an input for receiving the information from the input and an output for providing the error signal to the feedback control loop, whereas the additional feature of claim 13 with respect to claim 12 is that the feedback control loop is a decision directed feedback control loop. This is known from **D1** on figure 6.

3.8. The above applies mutatis mutandis to claims 15 to 21, 24 and 25, which define a method for controlling parameter in a feedback control loop and to claim 26 which defines an apparatus for reading an optical carrier comprising a feedback control loop as claimed in any one of the claims 1 to 14.

4. **It is not clear from the description which feedback control loop is to be protected by claim 1**:
- is that the timing recovery loop of figure 5, or the loop of figure 8, or the one of figure 10 ?
Moreover it is not clear how each of these enumerated loops functions in determining an error signal from a first area of the N-dimensional data block.
Claim 1 and respectively method claim 15 are therefore not supported by the description as required by Article 6 PCT, as their scope is broader than justified by the description and drawings.

PATENT COOPERATION TREATY

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)* see form PCT/ISA/210 (second sheet)	
Applicant's or agent's file reference see form PCT/ISA/220	**FOR FURTHER ACTION** See paragraph 2 below
International application No. PCT/IB2005/050263	International filing date *(day/month/year)* 24.01.2005
Priority date *(day/month/year)* 26.01.2004	
International Patent Classification (IPC) or both national classification and IPC G11B20/10, G11B20/18	
Applicant KONINKLIJKE PHILIPS ELECTRONICS N.V.	

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
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- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
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2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

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For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ in written format

   ☐ in computer readable form

   c. time of filing/furnishing:

   ☐ contained in the international application as filed.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-26
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-26
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations

see **separate sheet**

1. Reference is made to the following documents:
D1 : IMMINK A H J ET AL: "Signal processing and coding for two-dimensional optical storage" GLOBECOM'03. 2003 - IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE. CONFERENCE PROCEEDINGS. SAN FRANCISCO, DEC. 1 - 5, 2003, IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE, NEW YORK, NY : IEEE, US, vol. VOL. 7 OF 7, 1 December 2003 (2003-12-01), pages 3904-3908, XP010677345 ISBN: 0-7803-7974-8

D2 : WEEKS W: "Full-Surface Data Storage" THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ELECTRICAL ENGINEERING IN THE GRADUATE COLLEGE OF THE UNIVERSITY OF ILLINOIS AT URBANA- CHAMPAIGN, XX, XX, 2000, page complete, XP002227664

2. INDEPENDENT CLAIM 1

2.1. The present application does not meet the criteria of Article 33(1) PCT, because the subject matter of claim 1 does not involve an inventive step in the sense of Article 33(3)PCT.

2.1.1. Document **D1**, which is considered to represent the most relevant state of the art to the subject matter of claim 1, discloses (the references in parentheses applying to this document):

A feedback control loop (fig. 6: feedback control loop from the "2D Bit Detection (BD)" to the "2D Equalizer") for controlling parameters of a signal comprised in a block of data stored in a N-dimensional data block on a record carrier (fig. 6: ch1..ch11) where the feedback loop comprises an input for receiving an information from the record carrier ("HF_i": see equation 15 on page 3906, and page 3907, LH column, first paragraph) and error signal derivation means for deriving an error signal from the information ("HF_i-$REF_{i,cl}$": see equation 15 on page 3906).
First of all, in **D1**, the branch metric is calculated by equation (15) wherein the index "cl" as subscript denotes a "cluster-dependent reference signal (so it is based on the bits of the **first shell only**)" (see **D1** on page 3907, LH column, first paragraph). So in **D1**, the

branch metric or "error signal" for a stripe of h rows is calculated based on "a first area of the N-dimensional data block", wherein the first area is the first shell constituted by nearest neighbours 5A, 5B, 5C, 5E, 5F (see definition of a shell in the application on page 7, line 32, to page 8, line 5).

2.1.2. The subject-matter of independent claim 1 differs from the disclosure of **D1** in that: the first area is that area where the error signal can be determined within the shortest period of time.

2.1.3. The problem to be solved by the present invention may therefore be regarded as minimizing the delay and therewith increasing the stability of the feedback control loop. (see Application: page 1, line 25, to page 2, line 2).

2.1.4. The solution proposed in claim 1 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

D2 describes a MVA (Multitrack Viterbi Algorithm) for a full surface data storage in its chapter 3, from pages 25 to 56, and also equalization techniques in its chapter 4, from pages 57 to 71. This MVA processes overlapping sets of t rows (see **D2**, on section 3.3.7 on page 42). In its section 3.3.7 on page 42, an "alternative multitrack approach" is considered which processes t rows off received data in disjoint blocks, where it is explained that in cases of MVA or its alternative multitrack approach, bits on the top row of a so-called "t-block" or multidimensional block are subjects to the same error events in both cases, whereas bits on the bottom row of a "t-block" have a larger BER in the case of the alternative multitrack approach than in the case of the MVA. In **D2**, it is extensively disclosed how this MVA calculates errors.

The first area in **D1** is the first shell constituted by nearest neighbours 5A, 5B, 5C, 5E, 5F, and is enclosed in an larger sub-area of the t-block constituted by the first 2 rows and an outside bit row (see application on figure 1 for a definition of a shell). It contains so the outside bit row which is not part of the stripe to be processed (see application on page 8, lines 4, 5). The sliding direction is downwards on figure 1 as in figure 7 of **D1** and thus the reference levels of the previous Viterbi-block (or of the guard band for the top and bottom bit-rows) are used for the actual Viterbi-block. By doing this, the $REF_{i,cl}$ and thus the branch

metrics yielding the error signal can be determined within a shortest period of time as when using no outside bit row as a member of the cluster.

2.1.5. Therefore the features disclosed in **D1** and **D2** would be combined by the skilled person, without exercise of any inventive skills in order to solve the problem posed. The proposed solution in independent claim 1 thus cannot be considered inventive (Article 33(3) PCT).

3. Other claims

3.1. The additional feature of claim 2 with respect to claim 1 to which it refers is that the control loop is a high bandwidth control loop. This is not inventive either.

3.2. The additional feature of claim 3 with respect to claims 1 or 2 to which it refers is that the first area is a guard band area corresponding to the N-dimensional data block. This is obvious from **D1**, on figure 7 (see fig. 7: "g") following from the discussion on point 2.1.

3.3. The additional feature of claim 4 with respect to claims 1 or 2 or 3 to which it refers is that the feedback control loop is arranged for controlling parameters of a signal from a second area based on the error signal derived from the first area. This is obvious from the discussion on point 2.1, where the second area is the third, fourth, t-th rows inside a Viterbi window.

3.4. The additional feature of claim 5 with respect to claim 4 to which it refers is characterized in that a feedback control loop is additionally arranged for controlling parameters of a signal from the second area based on an error signal derived from the second area, whereas the additional feature of claim 6 with respect to claims 4 or 5 to which it refers is that the second area is the N-dimensional data block. This is obvious from **D2** in the alternative approach of disjoints blocks.

3.5. The additional feature of claim 7 with respect to claim 6 to which it refers is that the parameters of the signal from the second area are uniformly controlled using the error signal. Following from equation (15), this is obvious.

3.6. The additional feature of claim 8 with respect to claims 4 or 5 to which it refers is that feedback control loop is arranged for controlling parameters of a signal from a second area based on the error signal derived from the first area and a further error signal derived from a third area, whereas the additional feature of claim 9 with respect to claim 8 to which it refers is that the second area is the N-dimensional data block. This is the case in V_6 of figure 7 of **D1** where V_6 has as inputs the output of V_5 and the guard band.

3.7. The additional feature of claim 12 with respect to the previous claims is that the feedback control loop comprises a detector with an input for receiving the information from the input and an output for providing the error signal to the feedback control loop, whereas the additional feature of claim 13 with respect to claim 12 is that the feedback control loop is a decision directed feedback control loop. This is known from **D1** on figure 6.

3.8. The above applies mutatis mutandis to claims 15 to 21, 24 and 25, which define a method for controlling parameter in a feedback control loop and to claim 26 which defines an apparatus for reading an optical carrier comprising a feedback control loop as claimed in any one of the claims 1 to 14.

4. **It is not clear from the description which feedback control loop is to be protected by claim 1**:
- is that the timing recovery loop of figure 5, or the loop of figure 8, or the one of figure 10 ?
Moreover it is not clear how each of these enumerated loops functions in determining an error signal from a first area of the N-dimensional data block.
Claim 1 and respectively method claim 15 are therefore not supported by the description as required by Article 6 PCT, as their scope is broader than justified by the description and drawings.